BEFORE THE
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C.

In the Matter of	)	
	)	
	)	
Authorization and Use of Software Defined Radios	)	ET Docket No. 00-47
	)	
	)	

REPLY COMMENTS OF AIRNET COMMUNICATIONS

AirNet Communications Corporation is pleased to submit the following reply comments to the FCC in support of the Notice of Proposed Rule Making on SDR to continue its visionary plan to enable the industry to take full advantages of the SDR technology. AirNet also provides additional comments on the opinions of other commentors to the NPRM to ensure that the Commission will further its regulatory flexibility for the SDR technology with its new proposed rule to benefit the industry and public.

INTRODUCTION

As one of the pioneers of the SDR technology in its base station products, AirNet is pleased with the Commission's proposed new rules to support the development of SDR technology. In its comments to the NPRM, AirNet supports the following key FCC proposed rules:

- Definition of SDR, but also suggests that additional clarification be made to avoid wide interpretation of the definition

- Combined approval of both hardware and software - for certification by the FCC until it is confident with the technology.
- Class III permissive change to streamline the approval process for a software-defined radio. AirNet supports the FCC position that the Class III change be only applicable to the original grantee with software changes only to an approved SDR.
- Alternative labeling for SDR but encourage the flexibility of the methods of labeling since it may add undue burden on the manufacturers for certain equipment.
- Security of downloading the authorized software to the SDR device, but noting that the download methods not be standardized as requirements vary for different devices (i.e. base stations, handsets).

In addition, AirNet would like to emphasize that SDR will improve spectrum efficiency by enabling other technologies, such as adaptive array technology, which AirNet is actively developing for commercial mobile radio systems. This new technology is only economically viable on an SDR platform, not only because it increases the carrier-to-interference ratio (C/I), but because it lowers interference significantly allowing for the doubling of system capacity by higher frequency reuse. The combination of SDR and the adaptive array technology is the key to improving spectrum efficiency for CMRS.

I. Definition of Software Defined Radio

The Commission has proposed the following definition to describe those devices that are eligible for regulatory treatment as software defined radios:

> A software defined radio is a radio that includes a transmitter in which the operating parameters of the transmitter, including the frequency range, modulation type, or maximum radiated or conducted output power can be altered by making a change in software without making any hardware changes.

AirNet supports the SDRF in their proposed regulatory definition of Software Defined Radio. The SDRF proposed the following definition:

> A software defined radio is a radio that includes a transmitter in which the transmitter operating parameters of frequency range, modulation type, and maximum output power can be altered by making a change in software without making any hardware changes.

AirNet believes that the word "and" in lieu of "or" is critical since a radio must be able to accommodate changes to all three of the relevant RF parameters modulation, frequency, and power. AirNet proposes two other considerations in the definition, namely, to change the word transmitter to transceiver, which is in agreement with Cingular in their response to the NPRM and to permit that a software change should be extended to programmable logic that may be downloaded to hardware devices by a software application. For example, software changes that reconfigure hardware that were included in the original hardware platform design in a previous certification and approval process. AirNet agrees with the SDRF that new software that reconfigures preexisting hardware or firmware should be eligible for Class III regulatory treatment.

We therefore ask the Commission to modify the SDR definition to provide clearer and more concise interpretation of what constitutes a software change and hardware change that would be eligible for new streamline approval treatment.

II. The Commission "Class III" Proposal

In its comments, AirNet suggested that a software change should be extended to programmable logic that may be downloaded to hardware devices by a software application, for example, software changes that make use of hardware that was included in the original hardware platform design in a previous certification and approval process. AirNet suggested that software changes should also include software downloadable or configurable changes to programmable hardware devices.

AirNet supports the Commission's proposed rules requiring the original certification conforms to the definition of an SDR, and that only the grantee of the original authorization is allowed to file for a Class III permissive change to eliminate any confusion over the ownership of the authorization. AirNet also supports the Commission on its proposal to require that Class III permissive changes may only be requested where there are no hardware changes other than software re-programmed changes to previously approved hardware. AirNet agrees with the Commission that a Class III permissive change should be limited only to software change for the reasons that the Commission has suggested, i.e. eliminating the ambiguity as to the combination of hardware and software changes that has been approved. Moreover, such software change should include software programmable changes to hardware as previously suggested. Any hardware change to a SDR would disqualify the requested change as a Class III permissive change.

AirNet agrees with AT&T's comments in restricting the availability of Class III Permissive changes to the grantee of the equipment authorization for the SDR since we believe that it would help to ensure that unauthorized modifications are prevented. AT&T urges the Commission to announce any changes to a previously authorized SDR (Class III Permissive Changes or new applications) by descriptive public notice with sufficient detail concerning the nature of the change. AT&T stated that the purpose would enable licensees and unlicensed wireless service providers to assess the possible impact of the SDR in question. Although this recommendation appears to protect the adjacent service providers, AirNet believes that this requirement is considered excessive. Software downloads are not new to the industry. First, if Class III Permissive changes are only provided to the original grantee of the equipment authorization for the SDR, then the original grantee should be fully aware of the FCC requirements for interference and should be held responsible. AirNet believes that the Commission has included in their NPRM sufficient safeguards for Class III Permissive Changes. In fact, AirNet believes that the proposed requirements are in fact no less stringent than if the manufacturer applied for a new certification. The NPRM proposes that the applicant would submit test data showing that the equipment complies with the applicable requirements for the service(s) or rule parts under which it will operate with the new software loaded. The applicant would also have to demonstrate compliance with the applicable RF exposure requirements. The Commission would notify the applicant by letter when a permissive change is granted. Once a Class III permissive change has been granted for the software that affects the operating parameters, the software could be loaded into units in the field. It appears to AirNet that there would be no streamlining of any process under these

conditions for SDR unless the demonstration of compliance with the applicable RF exposure requirements could be accomplished through test data submissions. Adding anymore testing or review processes would only serve to delay the deployment and eliminate any advantages for the SDR capability. In addition, AirNet does not support the view of both Motorola and Nortel Networks on their proposals to include the hardware change in Class III permissive change to take advantage of the flexibility proposed for SDR to radio device that does not even qualify by definition. AirNet supports all other comments that discourage any requirement for software submission which would put undue burden on the Commission to review it for the approval and which would likely discourage manufacturers, particularly smaller innovators, from designating their equipment as a SDR to fully benefit from the new streamline process to bring its benefit to the public.

AirNet agrees with the Commission on the need for the alternative labeling method over existing re-labeling of new identification numbers for Class III permissive changes but encourages the Commission to provide the flexibility to support methods other than fixed LCD or LED display. An example of such a method is supporting removable displays such as on a laptop or PDA via standard interface to the radio equipment that traditionally does not need a local display (e.g., radio base station). The proposed LCD and LED method is applicable to subscriber terminals that integrate such displays but may not be applicable for other possible SDR devices. Therefore, AirNet suggests that any new requirement from the Commission on labeling should be sufficiently flexible to accommodate a variety of the SDR based devices that will be

available in the marketplace. This criteria was also supported by Motorola and Nortel Networks to avoid undue burden on the manufacturers of SDR.

In the matter of security and authentication of the software modifications to SDR devices, AirNet encourages the flexibility of the methods used to verify that software has been approved before the software can be downloaded to the SDR. As the Commission suggested, it may be the intention that software for a given hardware platform, such as SDR based subscriber terminals, may be generated by one or more parties other than the original manufacturer of the SDR. In these applications, a secure mechanism to ensure compliance would be required. However, this would not be the case for many SDR products such as base stations where the software download procedure is securely controlled by the manufacturer to protect its own IPR and its authorization. Thus, requiring complex security mechanism could add undue expense where the risk for unauthorized software activation is low. Therefore, AirNet suggests that the Commission allow a sufficient degree of flexibility to take into consideration the needs of different SDR devices in terms of distribution of software to them. This position was also supported by Nortel Networks and Motorola.. AT&T comments state that the NPRM does not specifically propose an authentication standard that would prevent end users or other third parties from unilaterally and illegally modifying an SDR's frequency assignments, output power, or similar technical parameters. AirNet supports Lucent in their original NOI comments that state "Flexibility in conformity assessment schemes are essential and consistent with conformity assessment trends worldwide. Requiring authentication codes for first party (hardware manufacturer) software deployment or

certification approval for ***all*** software changes would unnecessarily prolong the time needed to bring a product to market and would mandate substantially increased cost for consumers, service providers, and manufacturers. Lucent technologies believes that an FCC decision to impose such requirements would be damaging and are clearly unwarranted."

It is clear that security and authentication procedures will require careful scrutiny. Tampering is a serious issue, and one that deserves critical implementation techniques. AirNet believes that authentication procedures and methods should be carefully considered since standardization of common platforms for authentication could be the Achilles heel since one method alone is always a prime target for tampering. AirNet supports the Commission's view that the manufacturers of both handsets and base stations should have sufficient leeway to tailor authentication and security efforts to their specific needs. If standardization is to be implemented, it should be the responsibility of the standardization bodies and not the FCC. AirNet agrees that the grantee of the equipment authorization is responsible for ensuring the integrity of the authentication or security system. This nonetheless will place a large burden on both the manufacturer and the FCC for it is not always possible to guarantee by either party that the system integrity is infallible. Requiring complex security mechanisms could add undue expense where risk of unauthorized software is extremely low. Certainly for any SDR, the SDR should provide the necessary safeguards to ensure the software was properly downloaded without corruption preventing improper operation that would cause unintended changes to frequencies, output power, modulation types, etc. AirNet suggests an appropriate

degree of flexibility taking into consideration the means of source and distribution of software for the specific SDR product. Authentication safeguards will be different for an air interface system as compared to a secure download to a base station. The requirement for a standardized authentication process should ultimately be the responsibility of the service providers and the manufacturers.

AirNet does not believe that SDR poses any more threat than any other radio device and existing enforcement capability is more than adequate to prevent unauthorized modifications to SDR. The history of the wireless industry has demonstrated considerable credibility of self-governing to ensure compliancy to applicable Commission's rules. This view is also widely supported by other commentors. Thus, the Commission's additional enforcement capability is not warranted.

III. The Conclusion

In closing, AirNet is pleased to support the Commission's effort to improve and streamline the approval process to encourage the development and deployment of SDR to serve the public interests. In its comments, AirNet has provided additional considerations to the Commission on its proposed rules to help avoid the pitfalls of over-regulation that may stifle the promising SDR technology. AirNet is also pleased to have an opportunity to comment on, and to support the Commission in its path to successfully introduce SDR to benefit the American public. AirNet's reply comments are summarized below:

- AirNet applauds the Commission on its understanding of the promise of SDR and its action to help encourage development and deployment of SDR

- The definition of SDR should be more concise and specific to avoid open interpretation
- AirNet supports the Commission granting only Class III changes to previous SDR grantee but would not support the requirements for a copy of the software radio for approval due to the proprietary nature of such software. AirNet supports the reclassification of previous approved equipment to SDR if the equipment meets the FCC definition.
- AirNet supports the Commission on the alternative methods for re-labeling the SDR for Class III changes but requests that the labeling method be flexible to accommodate a variety of the SDR devices.
- AirNet supports the security of downloading the authorized software to the SDR device but notes that the downloading methods should not be standardized as the requirements are vastly different for different classes of SDR devices.
- Finally, AirNet believes that the Commission does not need the additional enforcement capability for SDR because the existing approval process should be sufficient to monitor compliance.